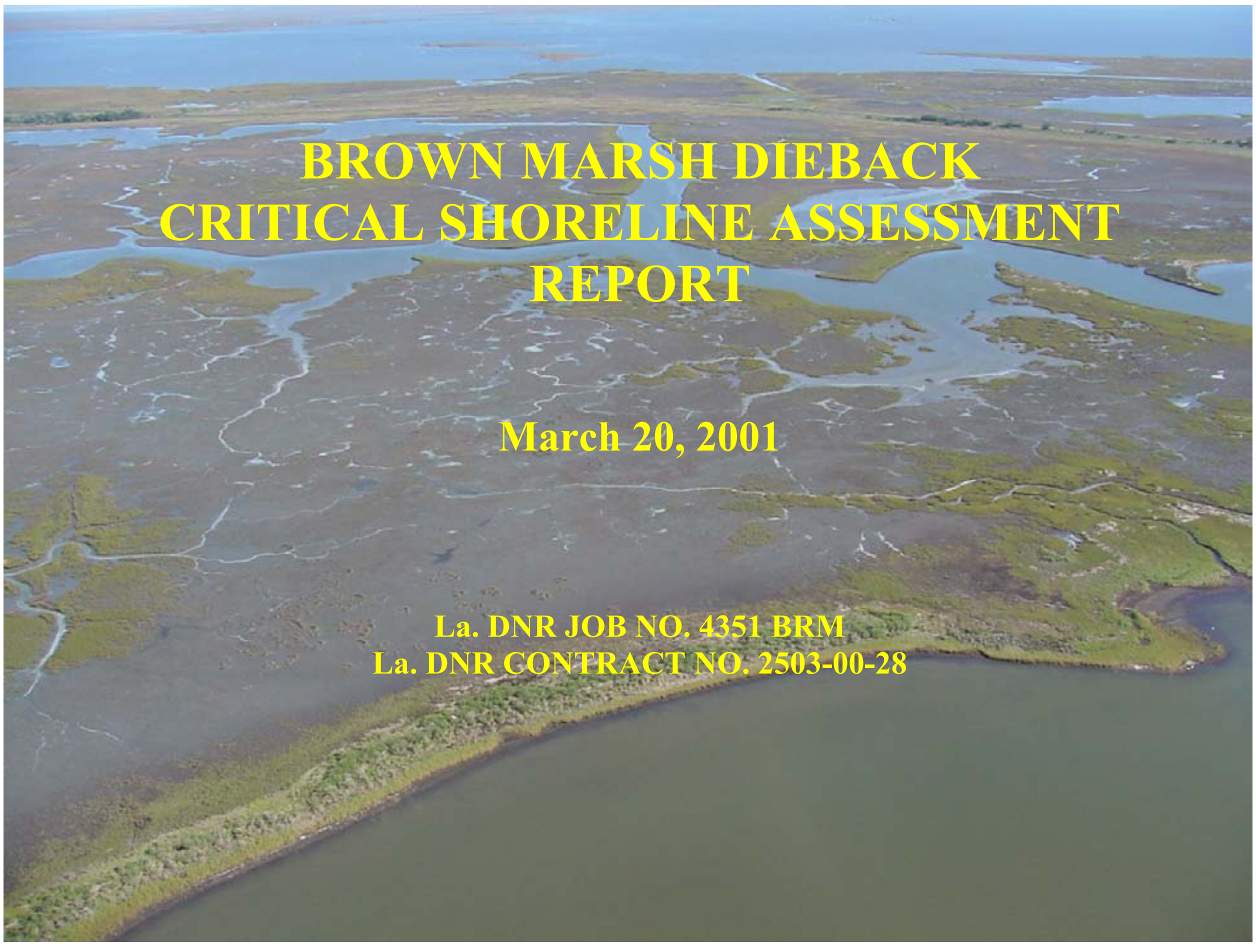
STATE OF LOUISIANA

DEPARTMENT OF NATURAL RESOURCES
COASTAL RESTORATION DIVISION



BROWN MARSH DIEBACK CRITICAL SHORELINE ASSESSMENT REPORT

March 20, 2001

La. DNR JOB NO. 4351 BRM
La. DNR CONTRACT NO. 2503-00-28

PREPARED BY:

mph
Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL SERVICES

283 Corporate Drive
P.O. Box 3106
Houma, LA 70361
http://www.mphinc.com
(504) 879-2731

BROWN MARSH DIEBACK CRITICAL SHORELINE ASSESSMENT REPORT

TABLE OF CONTENTS

Page

I. INTRODUCTION 1

II. CAUSES OF MARSH DIEBACK 1

III. SURVEY OF PROJECT AREA 3
- A. Initial Surveys of Dieback Areas 3
- B. LDNR Surveys of Dieback Areas 3

IV. IDENTIFICATION OF SEVERELY IMPACTED DIEBACK AREAS 5

V. REMEDIATION METHODS 8
- A. Increase Marsh Surface Elevation by Hydraulic Dredge 8
- B. Revegetation 9
- C. Shoreline Protection Measures 9
- D. Terraces 10

VI. SITE SELECTION CRITERIA 10

VII. ASSESSMENT BY AREA 11
- A. Pointe au Fer Island Area 11
- B. Oyster Bayou Area 11
- C. Bay Junop Area 12
- D. Taylor Bayou-Grand Bayou DuLarge Area 12
- E. Bayou Grand Caillou Area 12
- F. Dog Lake Area 12
- G. Pelican Lake-Lake Pelto Area 13
- H. Bayou Sale Area 13
- I. Cocodrie Area 13
- J. Lake Barre' Area 13
- K. Lake Tambour-Lake Chien Area 14
- L. Pointe aux Chene Ridge (Felicity Island) Area 14
- M. Little Lake Area 14
- N. Leeville-Fourchon Area 14
- O. Elmer's Island-Chenier Caminada Area 14
- P. Bayou Ferblanc Area 15
- Q. Creole Bay Area 15

TABLE OF CONTENTS (Cont.)

Page

R.	Queen Bess Island Area	15
S.	East Grand Terre Area	15
T.	Grand Pierre Area	16
U.	Bay Joe Wise Area	16

VIII. RECOMMENDATIONS ... 16

A.	Hydraulic Fill Demonstration Sites	17
B.	Aerial Seeding Demonstration Sites	18
C.	Recurrent Observation of the Dieback Areas	18

TABLES

Table 1	Summary of Severely Impacted Dieback Areas by Group	5
Table 2	Summary of Individual Dieback Areas According to Size	6
Table 3	Summary of the 25 Largest Individual Dieback Sites by Group	6
Table 4	Ranking Matrix of the Dieback Sites by Group	7

DRAWINGS

Title Sheet, Vicinity Map & Index

Sheet 1	West Project Area Vicinity Map & General Information November 21 & 22, 2000 Flight Line
Sheet 2	East Project Area Vicinity Map & General Information November 21 & 22, 2000 Flight Line
Sheet 3	Oyster Bayou Vicinity Map
Sheet 4	Bayou Grand Caillou Vicinity Map
Sheet 5	Bayou Sale Vicinity Map
Sheet 6	Cocodrie Vicinity Map
Sheet 7	Lake Felicity Vicinity Map
Sheet 8	Fourchon Vicinity Map
Sheet 9	Caminada Bay Vicinity Map
Sheet 10	Barataria bay Vicinity Map
Sheet 11	Bastian Bay Vicinity Map
Sheet 12	West Project Area Oyster Lease Map & Brown Marsh Impacted Areas
Sheet 13	East Project Area Oyster Lease Map & Brown Marsh Impacted Areas
Sheet 14	Proposed Remedial Demonstration Sites

APPENDICES

Appendix A	USGS-NWRC, NRCS, & LSU Study Sites
Appendix B	Area Calculations of Severely Impacted Dieback Sites
Appendix C	Digital Aerial Photographs November 21 & 22, 2000 Flyover
Appendix D	Acknowledgements

I. INTRODUCTION

In the summer of 2000, large expanses of coastal Louisiana marshes were observed to be prematurely browning in color. This prompted a considerable investigative effort by academia, state, and federal agencies to ascertain the extent and causes of this condition.

Subsequent investigations have revealed a vegetative dieback of unprecedented magnitude of the salt marsh species *Spartina alterniflora*, commonly called smooth cordgrass or oyster grass. Brown marsh dieback was observed through out the Gulf Coast region, but the most extensive areas occurred in the Mississippi River Deltaic plain of southeast Louisiana. All coastal Louisiana parishes surveyed, including Cameron, Vermilion, Iberia, St. Mary, Terrebonne, Lafourche, Jefferson, Plaquemines, and St. Bernard, exhibited some degree of damaged marsh vegetation.

Evidence of the brown marsh dieback was observed in the Leeville area of Lafourche Parish as early as April 1998 by the field investigator of the Lafourche Parish Coastal Zone Management Local Program. Observations by personnel of the La. Department of Natural Resources-Coastal Management Division in the Leeville area in the summer of 1999 also yielded evidence of dieback areas. Although attention was called to these sites, the sightings did not generate the same interest as the current dieback and indicates that the dieback process was in progress at those times.

In response, the Louisiana Department of Natural Resources-Coastal Restoration Division (LDNR) initiated an assessment of the dieback areas. Morris P. Hebert, Inc. (MPH) was retained to do an aerial survey of the coast of Louisiana from the Atchafalaya River to the Mississippi River, document the flight by video and with photography, develop drawings identifying the marsh dieback areas and acreage totals, and produce a report summarizing the causes of the dieback, and provide recommendations for remediation of impacted areas.

II. CAUSES OF MARSH DIEBACK

Historically and ecologically, marsh dieback is common. Publications on the subject in Louisiana date back to the early 1970's.

Diebacks have always occurred in Louisiana as part of the natural geomorphic processes of deltaic cycles. Small areas of dieback occur regularly and naturally in the interior areas of coastal marshes. These areas are more susceptible due to less accretion of sediments with consequent decrease of relative elevation and decreases in oxidation. This in turn may lead to greater periods of submergence and waterlogging. Under increasing anaerobic conditions, the demand for oxygen increases and causes sulfates (SO4), present in marine environments, to reduce to hydrogen sulfide (H2S), which at elevated levels is toxic to plants and roots. W.G. Smith in the *Coastal Studies Bulletin No.5 /Special Sea Grant Issue/ February 1970* cited possible factors that cause dieback which include:

- Changes in salinity range;
- Pathogenic organisms;
- Iron (Fe) reduction and sulfide toxicity;
- Changes in tidal regime; and,
- Pollutants

In 1990, LSU sponsored a symposium on marsh dieback at an Ecological Conference in Japan. Findings suggest that multiple stressors affecting the vegetation and the relations of the individual stressors were significant factors in dieback areas.

As in past dieback events, the exact cause of the current dieback remains elusive. Compared to past dieback events, this occurrence is more widespread than the typical localized events.

As the findings of the 1990 symposium suggest, the interaction of the environment and the plant communities is the key factor in dieback events. It is well known that Louisiana is experiencing severe coastal erosion. Sediment deficit, subsidence, relative sea-level rise, hydrologic modification, among others has resulted in the coastal areas being in a stressed condition. When factoring in secondary environmental influences that put the vegetative community in a compounded stressed state, plants become more vulnerable to changes in pathogenic, physical, or chemical conditions.

The general consensus is that the present dieback is weather related. Louisiana has experienced several years of drought conditions, with the year 2000 being classified as beyond extreme to exceptional. Climatic data from the USDA Experimental Sugarcane Lab in Houma, Louisiana indicated a departure from the mean average rainfall of -13.73 inches and -11.27 inches in 1999 and 2000, respectfully or nearly 20 % below average for the two years. The drought, the low river stages from the Mississippi and Atchafalaya Rivers, and a persistent high-pressure system over the North American Southern Plains, which produced northerly and westerly winds preventing the typical summer convection-type storms common in coastal Louisiana, generated extremely low water levels in the coastal regions during the summer of 2000. The combined effects allowed for stronger saltwater intrusion resulting in higher salinities throughout the coastal areas. Temperatures for the years 1999 and 2000 experienced an accumulative increase above average of 19.8 degrees and 24.8 degrees Fahrenheit, respectfully. The increase in temperature, the decrease in rainfall, and the lower water levels produced greater rates of evapotranspiration. As plants utilized the existing moisture, natural elements such as metals and sulfides, may have accumulated to toxic levels that were lethal to the already stressed plant communities.

Data was provided by Don Cahoon of the USGS-National Wetland Research Center (NWRC) from a study site located in the Oyster Bayou area. During the summer of 2000, a prolonged water level drawdown in response to prevailing winds and the lowering of marsh surface elevation due to evapotranspiration combined to add additional stress to the marsh vegetation. Data has revealed that the marsh surface elevation decreased due to dewatering and compaction of the substrate below the root zone and exhibited an atypical lengthy surface rebound period. Sediment composition, particularly the shrink-swell characteristics of the mineral soils, seemed to be a factor in water retention and availability as well as the possible spatial distribution of the dieback areas.

In summation, the immediate and prevalent environmental factors with the existing regional conditions of the Louisiana coastal areas combined to set the stage for a widespread dieback event.

III. SURVEY OF THE PROJECT AREA

A. Initial Surveys of Dieback Areas

The Louisiana Department of Wildlife and Fisheries (LDWF) and the USGS National Wetland Research Center (NWRC) initiated aerial surveys during the summer of 2000 to identify and determine the extent of the dieback areas.

Greg Linscombe and Bob Chabreck of the LDWF conducted an aerial survey in August 2000 of the Barataria-Terrebonne Basins of Southeast Louisiana using transects that were developed over 30 years for evaluating the vegetation of the coastal areas. Transects were flown in a north-south orientation and spaced approximately 1.87 miles apart. Saline marshes were surveyed from Four League Bay to the Mississippi River.

Tom Michot and Chris Wells of the NWRC conducted monthly aerial surveys beginning in June 2000. Flight transects generally followed the coastline along the coastal margins of the salt marsh zone and the inland salt-brackish marsh interface. Saline marshes were surveyed from Pointe au Fer Island to the Mississippi River.

A classification system, developed by Tom Michot was utilized to categorize the condition of the marsh. The categories include: normal, green vegetation; moderately stressed, brown-in-green vegetation and green-in-brown vegetation; and severely stressed, completely brown vegetation to exposed soils.

Results of all the surveys were summarized and compiled at the NWRC. Thirty-five percent or 137,655 acres are classified as normal, thirty-eight percent or 145,935 acres are classified as moderately stressed, and twenty-seven percent or 105,507 acres are classified as severely stressed. Combined results from aerial surveys conducted by LDWF and NWRC indicate that the greatest impact on saline marshes is in Terrebonne Parish- 73,840 acres and Lafourche Parish- 55,704 acres of combined moderate and severely stressed areas.

B. LDNR Surveys of Dieback Areas

The LDNR initiated an assessment of the dieback areas in order to identify critical shorelines and impacted areas suitable for remediation actions. The project area ranges from the Atchafalaya River to the Mississippi River along the coastal areas. LDNR and MPH conducted two aerial surveys. The first aerial survey was flown on October 13, 2000. The second aerial survey was flown on November 21 & 22, 2000.

Participants on the first flight included Clark Allen of LDNR and David Cloud and Matthew Sevier of MPH. Southern Seaplane provided the fixed-wing aircraft and pilot.

This flight was to investigate the extent of the dieback and the means to achieve the assessment of the impacted areas.

Participants on the second flight included Kenneth Bahlinger of LDNR and Brian Kendrick and Matthew Sevier of MPH. The aircraft was provided by Southern Helicopters and was piloted by Reggie Fontenot. The second survey was conducted by helicopter in order to achieve a more in depth assessment of the dieback areas and to determine and identify critical shorelines and dieback areas.

The November 21, 2000 flight surveyed the west project area from Pointe au Fer Island to east of Cocodrie and generally followed the established LDWF vegetation transects. The November 22, 2000 flight surveyed the east project area from east of Cocodrie to Bastian Bay and generally followed a flight path to impacted areas previously identified by LDWF, NWRC, the LDNR October aerial survey, active dieback study sites (see appendix A), and visually observed dieback areas.

Severely stressed dieback areas were visually discernable by exposed soils on a slightly elevated marsh platform. A coastal flood and storm event in mid-November combined to remove dead vegetation from the project area. Evidence of this was observed by the presence of wrack lines through out the coastal region and in close proximity to the dieback areas. By mid November, the natural and seasonal browning of the marsh had begun. The moderately stressed areas were not as distinct. Assessment efforts were concentrated mainly on the exposed soil areas. Aerial surveys conducted by Tom Michot of the NWRC from summer 2000 until December 2000, indicated no recovery of the dead areas. However, there was observed greening of the moderately impacted areas. This was in response to improving environmental conditions. The monthly rainfall total for November 2000 was 13.36 inches at the USDA Sugarcane Lab, nearly 10 inches above normal. The LDNR November aerial survey observed this as well.

Approximately 825 digital still photographs and approximately two hours of video were taken during the LDNR November aerial survey. This information was used to identify, document, and delineate the severely stressed dieback areas onto the drawings.

MPH has provided 15 drawings. They include a title sheet and thirteen plates (sheets 1 through 13) illustrating the dieback areas and one plate (sheet 14) illustrating the proposed remediation sites. These plates were developed using the USGS geo-rectified Digital Ortho Quarter Quadrangle (DOQQ) aerials flown in February 1998 of the project area. The resolution of the DOQQ's were reduced by a 1:8 ratio using the MrSid software and exported into an AutoCAD 2000 drawing using 1983 North American Datum (NAD83) horizontal coordinates. Sheets 1 and 2 present the dieback areas at a scale of 1:10,000. Sheets 3 through 11 illustrate the severely impacted dieback areas at a 1:3,000 scale along with the location and direction of the digital photographs and soil classifications obtained from the USDA Soil Surveys. Sheets 12 and 13 illustrate oyster leases and dieback areas in the project area at a 1:10,000 scale. Sheet 14 provides proposed remediation sites at a 1:2000 scale.

IV. IDENTIFICATION OF THE SEVERELY IMPACTED DIEBACK AREAS

The dieback areas were characterized as bare soils, with little vegetative growth and fringe vegetative growth, located in interior marsh areas and shorelines of marsh ponds, tidal channels, bayous, lakes, bays, passes, and Gulf of Mexico (Gulf) shorelines. Due to the complexity, the observed dieback areas were classified as severely impacted dieback areas. The dieback areas were digitized on the respective drawings and categorized into twenty-one groups, A through U, based on their geographic locations. Acreages of the severely impacted dieback areas were totaled for each group and are included in Appendix C. A summary of the severely impacted dieback areas within each designated group is presented in Table 1.

Table 1
Summary of Severely Impacted Dieback Areas by Group

Group I.D.	Location	Severely Impacted Dieback Area (Acres)
A	Pointe au Fer Island Area	218
B	Oyster Bayou Area	98
C	Bay Junop Area	505
D	Taylor Bayou-Grand Bayou DuLarge Area	1,117
E	Bayou Grand Caillou Area	1,086
F	Dog Lake Area	1,573
G	Pelican Lake-Lake Pelto Area	287
H	Bayou Sale Area	246
I	Cocodrie Area	487
J	Lake Barre Area	914
K	Lake Tambour-Lake Chien Area	579
L	Pointe aux Chene Ridge (Felicity Island) Area	1,980
M	Little Lake Area	699
N	Leeville-Fourchon Area	4,215
O	Elmer's Island-Chenier Caminada Area	64
P	Bayou FerBlanc Area	55
Q	Creole Bay Area	163
R	Queen Bess Island Area	86
S	East Grand Terre Area	91
T	Grand Pierre Area	674
U	Bay Joe Wise Area	20
Total Acreage of Severely Impacted Dieback Marsh		**15,157 Acres**

As shown in Table 1, the five largest dieback areas were identified in the N) Leeville-Fourchon Area, L) Pointe aux Chene Ridge (Felicity Island) Area, F) Dog Lake Area, D) Taylor Bayou-Grand Bayou DuLarge Area, and E) Bayou Grand Caillou Area. Over two-thirds of the total observed dieback areas identified in the project area were observed in the five groups. A total of 15,157 acres of severely impacted dieback marsh was calculated from 469 digitized areas. This constitutes approximately 6.7% of the total 226,935 acres of saline marsh or approximately 1.8% of the entire 912,300 acres of marsh (as of 1990) found in the Terrebonne-Barataria hydrologic basins. Of the 469 areas digitized, the minimum, maximum and average areas were ¼-acre, 1,082 acres, and 32 acres, respectively with a standard deviation of 91. Table 2 presents a summary of the individual dieback areas according to size. As shown in Table 2, the majority of the sites ranged between 1 and 25 acres in size.

Table 2
Summary of Individual Dieback Areas According to Size

Size of Severely Impacted Dieback Area	No. of Sites Identified
< 1 acre	21
> 1 acre and < 5 acres	150
> 5 acres and < 10 acres	93
> 10 acres and < 25 acres	106
> 25 acres and < 50 acres	41
>50 acres and < 75 acres	14
>75 acres and < 100 acres	12
>100 acres and < 250 acres	19
>250 acres and <500 acres	8
>500 acres and < 1,000 acres	4
>1,000 acres	1

Severely impacted dieback areas were also evaluated based on individual size. The 25 largest sites were located in a total of 10 groups as shown in Table 3. The top three groups (N, L, and F) having the largest individual sites were found to rank identically to groups having the largest cumulative impacted areas. The largest 25 individual sites constitute approximately 59% of the total severely impacted dieback areas identified in the project area.

Table 3
Summary of the 25 Largest Individual Dieback Sites by Group

Group I.D.	Location	No. of Sites	Acreage
N	Leeville-Fourchon Area	9	3,440
L	Pointe aux Chene Ridge (Felicity Island) Area	5	1,837
F	Dog Lake Area	3	1,310
T	Grand Pierre Area	2	335
I	Cocodrie Area	1	295
D	Taylor Bayou-Grand Bayou DuLarge Area	1	294
J	Lake Barre Area	1	253
E	Bayou Grand Caillou Area	1	246
K	Lake Tambour-Lake Chien Area	1	168
M	Little Lake Area	1	162
	Totals	25	8,342

An overall ranking of the dieback areas by group was performed. Ranking criteria include total dieback acreage, bay shoreline length, Gulf shoreline length, ecosystem impact, property/infrastructure protection, and oyster leases. A matrix was developed using the ranking system to achieve a cumulative total. As shown in Table 4, the six dieback areas ranking the highest, thereby demonstrating the greatest rehabilitation needs, include N) Leeville-Fourchon, D) Taylor Bayou-Grand Bayou DuLarge, L) Pointe aux Chene Ridge, E) Bayou Grand Caillou, K) Lake Tambour-Lake Chien, and J) Lake Barre' Area. A higher ranking of the areas D, E, K, and L reflects the ecosystem impact (land bridge) ranking criteria.

V. REMEDIATION METHODS

Upon the identification of the locations and extent of severely impacted dieback areas, potential construction remediation methods are to be evaluated, and determine if one or a combination of methods could be used for rehabilitation. In the publication *Aquatic Botany 51 (1995) p. 281-289*, an article entitled "*Causes for vegetation dieback in a Louisiana salt marsh: A bioassay approach"*, stated that the stress from increased submergence associated with high rates of relative sea level rise is responsible for vegetation dieback. The authors recommend implementing management strategies, such as sediment additions that increase marsh elevation to relieve waterlogging stress.

Based on recommendations from existing publications and MPH's knowledge and experience in the area, the most practical and economical way to rehabilitate the dieback areas would be to increase the marsh surface elevation by using a hydraulic dredge, then revegetate with salt marsh vegetation such as *Spartina alterniflora*. Shoreline protection is also recommended in areas susceptible to severe shoreline erosion such as along the open Gulf, bays, lakes and passes. Shoreline erosion attributable to vessel traffic should also be considered when protecting bayous and passes. The following construction techniques were evaluated.

A. Increase Marsh Surface Elevation by Hydraulic Dredge

Taking fill material from an existing open water body and placing a thin layer of the material over the impacted area can increase the elevation of the existing marsh and dieback areas. A small, shallow-draft hydraulic dredge with an eight to twelve inch discharge pipe would be best suited in borrow areas with low wave energies. Larger dredges would be required in borrow areas in open Gulf, passes, lakes, and bays having high wave energies. Small earthen berms or containment dikes should be constructed at the perimeter of the fill area to allow stacking of the material and to allow the directing of outflow, thus reducing impacts to near by oyster leases. Material used to construct the dikes should be obtained from within the fill area so that the excavation hole is refilled after dredging operations. Dredging operations should be conducted at a time when water conditions are fresher so that the dredge material will have less salts. Once the dredging is complete, vegetative plantings will be used to assist in recovery.

Construction costs for small dredge projects typically include a lump sum mobilization/demobilization cost of about $20,000 for each site, a $4 to $7 per linear foot cost to construct the containment dikes and a unit rate of about $2.50 per cubic yard for material excavated from the borrow area. An additional $1.00 per cubic yard should be added if a booster pump is required when pumping over 2 miles between the borrow and fill areas.

Assuming a 10-acre small dredge project requiring containment dikes and a final fill height of 12-inches above existing marsh, the estimated total construction cost would be approximately $155,000 or $15,500 per acre. Additional costs for project administration, permitting, surveying, clearing utilities, engineering and design, preparation of construction bid documents, and inspection services will be on the order of $5,000 to $10,000 per acre depending on the location and complexity of the project.

B. Revegetation

Revegetation of the dieback areas may be achieved through various methods. **Plantings** using cultivated plugs of may be used to aid in recovery. Through time, expansion of the plants will cover the area. Problems associated with this include the vastness of the dieback areas and accessing the sites to be planted. **Seeding** the area using aerial application has been discussed. Rice farmers in southwestern Louisiana use crop dusters to aerially apply rice seeds to the fields. This method has been successfully utilized in the coastal regions. One problem of seeding with *Spartina alterniflora* is the viability of the seeds. Alterniflora seeds usually last one year under the best of conditions and germination is extremely peculiar. Aerial application may be used with other species. **Alternate species** may be used to vegetate the dieback areas. The dieback areas are particularly vulnerable to lose surface elevation through erosion and scouring. *Distichlis spicata*, commonly called salt grass is an example of a species that may be used in this type of environment. It is fast growing and invasive, but will allow the natural vegetation to eventually grow back. Other species including *Avicennia germinans*, black mangrove and *Batis maritima,* saltwort were observed to have survived in the dieback areas and may also represent suitable alternate species for revegetation.

Installation costs for *Spartina alterniflora* typically average about $4 per plug or $7 per trade gallon. Assuming a 6'x 6' grid spacing, revegetation with *Spartina alterniflora* will cost between $5,000 and $8,500 per acre. Cost for aerial distribution of seeds are between $100- $200 per acre.

C. Shoreline Protection Measures

Shoreline protection around a severely impacted dieback area will help stabilize the area until the vegetation can be reestablished. Limestone **rocks** should be placed along shorelines susceptible to high erosion rates attributed from large wave action. **Concrete matting** can be used to protect interior shoreline from eroding. New designs allow vegetation to grow through the mats. The mats may be removed once the vegetation has recovered. Placement of rocks and concrete mats will offer a longer lasting stabilization technique. **Fiber mats** may also be used to line an interior shoreline that is experiencing erosion. Embedding seeds into the mats will accelerate the vegetation process. **Earthen dikes** may also be constructed to reinforce the existing shoreline.

Shoreline protection systems are relatively expensive measures when compared to other protection measures such a terracing, but once installed, they will last for extended periods of time. A rock system is recommended in high wave energy areas. Total costs for a typical rock protection system range from approximately $125 to $150 per liner foot. A concrete matt system is recommended in low to moderate wave energy areas and cost approximately $75 to $115 per linear foot. Additional costs associated with having to construct floatation channels to get to the project area may also be encountered. Typical coconut fiber mats come in 3' x15' sections and have a unit cost of $12/square yard or $50 per linear foot installed. The fiber mats can be embedded with emergent or submergent vegetation to establish plant communities upon implementation. Fiber mats have demonstrated a wave dampening ability, but would not be applicable in a high to moderate wave energy environment. The mats are considered temporary measures due to the deterioration rates of the fibers.

D. Terraces

Terraces consist of constructing linear earthen mounds in open water areas so that fetch distances are decreased. This type of structure will aid in decreasing the erosion forces in front of the impacted areas or impacted areas that are converting to open water. To date, two terracing projects located Little Vermilion Bay and the Sabine Wildlife Management Area have been constructed and several others are currently in the implementation stage. None of these projects are located with the Terrebonne-Barataria Basins.

For the Little Vermilion Bay Project, construction, vegetation and engineering costs were $224,000, $55,000, and $100,000, respectively. The project consisted of constructing 21,300 linear feet of terracing constructed on 4 horizontal to 1 vertical side slopes, with a crest elevation of +6 feet NAVD and a crest width of 20 feet. Though the total cost to complete this terracing project was approximately $18 per linear foot, the DNR project manager stated that a unit rate of approximately $35 per linear foot would be more representative in today's market value.

The initial construction of a terracing project is typically less expensive than the first costs encountered in a hydraulic dredging or shoreline protection project. However, the long-term maintenance costs and overall total costs associated with a terracing project are expected to be significantly more making this type of structure a less viable solution to the long-term rehabilitation of dieback areas. Terracing should be used as a temporary measure or short-term solution and is not recommended as a long-term solution to the problem.

VI. SITE SELECTION CRITERIA

The Barataria-Terrebonne National Estuary Program (BTNEP) was chosen to serve as a focal point for coordinating academia, and local, state, and federal government efforts related to the current marsh dieback. In response, the BTNEP reconvened the Scientific Technical Committee for establishing marsh dieback procedure. The Research and Assessment Sub-Committee was formed to address the various needs associated with the dieback. Remediation site selection criteria was developed through the Sub-Committee and is presented as follows:

- **Ecosystem Impact---**Sites should be chosen that have the potential to offer protection to additional areas. An example is hydrologic modification. If an impacted coastal area erodes to open water, then the area immediately inland will begin to experience degradation.

- **Land Rights---**Minimal land rights issues will be required for site selection. Oyster leases need to be minimal in order to cutback on compensation to a leaseholder. A single landowner is easier to coordinate than multiple landowners.

- **Protect Property/Infrastructure---**Sites should be located where people, development, and infrastructure may be at greater risk from the loss of marsh.

- **Severely Impacted Areas---**Areas that have experienced extremely large and complete dieback need to be addressed for remediation. Areas with exposed soils are particularly vulnerable to erosion forces. Marsh surface elevations will be constantly decreasing from the scouring effects of winds, rains, storms, and tidal action.

- **Adjacent Research Sites---**Remediation sites should be located near the designated Dieback Study Sites in order to utilize any on-going research.

- **Addressing Dead vs. Stressed Areas---**The Sub-Committee was concerned whether rehabilitation efforts should focus on dieback areas or preventing stressed areas from becoming completely dead areas. This criterion remains to be addressed as supportive facts are revealed.

In determining the proposed remediation sites illustrated on Sheet 14 on the drawings, MPH has applied the site selection criteria to most practical extent possible.

VII. ASSESSMENT BY AREA

Individual area assessments will be put forth in this section. All areas have similar geomorphic characteristics with complex interactions. They include large expanses of coastal and inland marshes, solid and broken marsh, various sizes of marsh islands, interior marsh areas, marsh ponds, large and small lakes, bays, tidal channels, major and minor bayous, major passes to the Gulf of Mexico (Gulf) and Gulf shorelines. Types of impacted dieback areas include interior marsh, shorelines of marsh ponds, tidal channels, bayous, lakes, bays, passes, and Gulf shorelines. The following will provide a general description of the types of dieback locations along with acreage for each area. Shorelines will be classified as high energy for Gulf waves and moderate energy for waves of bays, lakes, passes, and the larger bayous.

A. Pointe au Fer Island Area

The dieback areas observed on Pointe au Fer Island were generally located in the interior areas of the island and the interior marsh areas. These areas typically had brown vegetation with little exposed soils. One small area located on the Four League Bay side had exposed soils along a tidal channel and interior marsh. Four impacted sites in Group A were identified for a total of 218 acres. Sheet C-1 in Appendix C has two aerial photographs representative of this dieback area.

B. Oyster Bayou Area

The dieback areas observed in the Oyster Bayou Area were generally located in the marsh interior. These areas had brown vegetation with exposed soils. There are oyster leases located in the bay and bayous. Four impacted sites in Group B were identified for a total of 98 acres. Sheet C-2 in Appendix C has two aerial photographs representative of this dieback area.

C. Bay Junop Area

The dieback areas observed in the Bay Junop Area are widespread. Locations of the dieback areas include interior marshes and marsh islands, shorelines along tidal channels, canals, major bayous and passes leading to the Gulf, and Gulf shorelines. There are vast areas of impacted coastal and inland marshes, as well as marsh islands, which serve as protection for the inland marshes. The area is a major oyster producing location with many active oyster leases. Twenty-seven impacted sites in Group C were identified C for a total area of 505 acres. Approximately 0.9 and 4.6 miles of shoreline border dieback areas that are exposed to high and moderate wave energy levels, respectively. Sheet C-3 in Appendix C has two aerial photographs representative of this dieback area.

D. Taylor Bayou-Grand Bayou DuLarge Area

The dieback areas observed in the Taylor Bayou-Grand Bayou DuLarge Area are extremely widespread. Dieback areas are located in the interior marshes, shorelines along tidal inlets, marsh ponds, lakes, canals, major bayous and passes leading to the Gulf, and Gulf shorelines. There are vast areas of impacted coastal and inland marshes, and marsh islands, which serve as protection for the inland marshes. The area is a major oyster producing location and has many active oyster leases. Thirty impacted sites in Group D were identified for a total of 1,117 acres. Approximately 3.7 and 6.8 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheets C-4, C-5, and C-6 in Appendix C have five aerial photographs representative of this dieback area.

E. Bayou Grand Caillou Area

The dieback areas observed in the Bayou Grand Caillou Area are extremely widespread. Dieback areas are located in the interior marshes, shorelines along tidal channels, canals, major bayous and passes leading to the Gulf, and Gulf shorelines. There are vast areas of impacted marshlands, coastal and inland, and marsh islands, which serve as protection barriers for the inland marshes. The area is a major oyster producing location and has many active oyster leases. Forty-six impacted sites in Group E were identified for a total of 1,086 acres. Approximately 1.8 and 4.3 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheets C-6, C-7, and C-8 in Appendix C have five aerial photographs representative of this dieback area.

F. Dog Lake Area

The dieback areas observed in the Dog Lake Area are extremely widespread. Dieback areas were located mostly in the inland marsh areas away from the immediate coastal areas. This area is characterized by numerous bayous, marsh ponds, lakes, tidal channels, and broken marsh. Dieback was present in the interior marsh areas and along the shorelines of lakes, bayous, marsh ponds, and tidal inlets and channels. Intact fringe vegetation was also observed through out the area. Oyster leases are present in the larger lakes and bayous, but are not wide spread. Twenty-two impacted sites in Group F were identified for a total of 1,573 acres. Approximately 0.6 and 1.7 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheet C-9 in Appendix C has two aerial photographs representative of this dieback area.

G. Pelican Lake-Lake Pelto Area

The dieback areas observed in the Pelican Lake-Lake Pelto Area are more localized. This area is positioned closer to the immediate coastal area. Dieback areas were located mostly along major bayous, interior marsh, marsh ponds, bays, lakes, tidal channels, and marsh barrier islands. These islands serve as an initial buffer offering protection to inland areas. Oyster leases are present in the more protected areas of the major bayous and lakes and are not wide spread. Twenty-seven impacted sites in Group G were identified for a total of 287 acres. Approximately 1.3 and 1.6 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheet C-10 in Appendix C has two aerial photographs representative of this dieback area.

H. Bayou Sale Area

The dieback areas observed in the Bayou Sale Area are very localized. Dieback areas were located mostly in the interior marshes adjacent to bayous, marsh ponds, and tidal channels. Some shorelines were exposed in the marsh interiors. The area is a major oyster producing location and has many active oyster leases. Twenty-three impacted sites in Group H were identified for a total of 246 acres. Sheet C-11 in Appendix C has two aerial photographs representative of this dieback area.

I. Cocodrie Area

The dieback areas observed in the Cocodrie Area are especially localized. Dieback areas were mostly located on the remnant distributary ridges along the interior marsh and lake shorelines. The area is a major oyster producing location and has many active oyster leases. Twenty-six impacted sites in Group I were identified for a total of 487 acres. Approximately 3.6 and 2.6 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheet C-12 in Appendix C has two aerial photographs representative of this dieback area.

J. Lake Barre' Area

The dieback areas observed in the Lake Barre' Area are widespread. A land bridge between Lake Barre' and an extensively eroded area of open water to the north is experiencing extreme marsh degradation. Dieback areas are located on this land bridge in the marsh interior and shorelines of bayous, lakes, marsh ponds, tidal channels, and bays. The area is a major oyster producing area with active oyster leases located in the main bayous of the land bridge. Forty-nine impacted sites in Group J were identified for a total of 914 acres. Approximately 1.1 and 2.1 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheet C-13 in Appendix C has two aerial photographs representative of this dieback area.

K. Lake Tambour-Lake Chien Area

The dieback areas observed in the Lake Tambour-Lake Chien Area are widespread. This area serves as land bridge and is in a state of extreme marsh degradation. Dieback areas occur in interior marsh areas and shorelines of bayous, lakes, marsh ponds, and tidal channels. The area is a major oyster producing region and has numerous active oyster leases. Twenty-four impacted sites in Group K were identified for a total of 579 acres. Approximately 2.1 and 3.3 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheet C-14 in Appendix C has two aerial photographs representative of this dieback area.

L. Pointe aux Chene Ridge Area (Felicity Island) Area

The dieback areas observed in the Felicity Island Area are extremely widespread. Dieback areas occur in the interior marsh, shorelines of bayous, marsh ponds, tidal channels, and bays. Marsh islands at the southern area of Felicity Island have experienced dieback in the interior areas and along shorelines. Oyster leases are present, but are not wide spread. Eleven impacted sites in Group L were identified for a total of 1980 acres. Approximately 19.2 miles of shoreline border dieback locations that are exposed to high wave energy levels. Sheets C-15 and C-16 in Appendix C have four aerial photographs representative of this dieback area.

M. Little Lake Area

The dieback areas observed in the Little Lake Area are widespread. Dieback areas occur in interior marshes, and along shorelines of bayous, marsh ponds, tidal channels, bays, and lakes. Fringe vegetation was prevalent throughout this area. Numerous active oyster leases are found in the area. Eighteen impacted sites in Group M were identified for a total of 699 acres. Approximately 3.3 and 1.6 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheet C-17 in Appendix C has two aerial photographs representative of this dieback area.

N. Leeville-Fourchon Area

The dieback areas observed in the Leeville-Fourchon Area are extremely widespread. Dieback areas occur in interior marshes, and along shorelines of bayous, marsh ponds, tidal channels, bays, lakes, and canals. Vast areas of marsh were impacted in this area. Oyster leases are present but are not widespread. Forty-four impacted sites in Group N were identified for a total of 4,215 acres. Approximately 17.0 and 7.1 miles of shoreline border dieback locations are exposed to high and moderate wave energy levels, respectively. An additional 5.0 miles of shoreline along Bayou Lafourche contiguous to dieback locations are subject to erosion from vessel traffic. Sheets C-18 and C-19 in Appendix C have four aerial photographs representative of this dieback area.

O. Elmer's Island-Chenier Caminada Area

The dieback areas observed in the Elmer's Island-Chenier Caminada Area are particularly localized. Dieback areas on Elmer's Island are located on the remnants of the chenier ridges, with dead marsh across the ridge from open water to open water. The dieback area of the uninhabited part of Chenier Caminada was located mainly in the interior marsh. A moderate amount of oyster leases are located in this area. Six impacted sites in Group O were identified for a total of 64 acres. Approximately 0.9 and 0.5 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheet C-20 in Appendix C has two aerial photographs representative of this dieback area.

P. Bayou Ferblanc Area

The dieback areas observed in the Bayou Ferblanc Area are localized and linear. Dieback areas occur in the marsh interior and along the shorelines of bayou and marsh ponds. Oyster leases are located in Bayou Ferblanc and nearby small lakes. Twelve impacted sites in Group P were identified for a total of 55 acres. Sheet C-21 in Appendix C has two aerial photographs representative of this dieback area.

Q. Creole Bay Area

The dieback areas observed in the Creole Bay Area are widespread. Dieback areas are present in the interior marsh and shorelines of bayous, lakes, marsh ponds, tidal inlets, and bays. Several oyster leases are located in the bays, lakes, passes, and bayous. Twenty impacted sites in Group Q were identified for a total of 163 acres. Approximately 0.7 miles of shoreline border dieback locations that are exposed to moderate wave energy levels from the bay. Sheet C-22 in Appendix C has two aerial photographs representative of this dieback area.

R. Queen Bess Island Area

The dieback areas observed in the Queen Bess Area are localized. Dieback areas are present in the interior marshes, and along shorelines of tidal channels, marsh ponds, and bays. There are numerous active oyster leases located in the area. Fourteen impacted sites in Group R were identified for a total of 86 acres. Approximately 2.2 miles of shoreline border dieback locations that are exposed to moderate wave energy levels from the bay. Sheet C-23 in Appendix C has two aerial photographs representative of this dieback area.

S. East Grand Terre Area

The dieback areas observed in the East Grand Terre Area are localized. Dieback areas occur mainly in the interior marshes of the inland bays and the Gulf shoreline. Island remnants located in the bay north of East Grand Terre exhibited dieback in the interior areas and shorelines. Some oyster leases are present in the vicinity and occur infrequently. Twenty-seven impacted sites in Group S were identified for a total of 91 acres. Approximately 0.3 and 4.5 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheet C-24 in Appendix C has two aerial photographs representative of this dieback area.

T. Grand Pierre Area

The dieback areas observed in the Grand Pierre Area are extremely widespread. This area contains a barrier island and marsh island characterized by bayous, canals, marsh ponds, lakes, tidal channels, and broken marsh. Dieback areas occur in the interior marshes, along shorelines of bayous, lakes, canals, tidal channels, marsh ponds, and in the interior marshes behind the Gulf shoreline. This area is a major oyster producing area with a vast amount of active leases. Twenty-six impacted sites in Group T were identified for a total of 674 acres. Approximately 0.7 and 7.4 miles of shoreline border dieback locations that are exposed to high and moderate wave energy levels, respectively. Sheets C-25 and C-26 in Appendix C have four aerial photographs representative of this dieback area.

U. Bay Joe Wise Area

The dieback areas observed in the Bay Joe Wise Area are particularly localized. Dieback areas occur in the interior marsh behind the Gulf shoreline and bayous. Numerous active oyster leases are located in this area. Seven impacted sites in Group U were identified for a total of 20 acres. Approximately 0.7 miles of shoreline border dieback locations that are exposed to high wave energy levels from the Gulf. Sheet C-27 in Appendix C has two aerial photographs representative of this dieback area.

VIII. RECOMMENDATIONS

The most extensive dieback areas are in the Leeville-Fourchon, Pointe au Chene Ridge (Felicity Island), Dog Lake, Bayou Grand Caillou, Taylor Bayou-Grand Bayou DuLarge, Lake Barre', Little Lake, Grand Pierre, Lake Tambour-Lake Chien, Cocodrie, and Bay Junop groups. Most of dieback areas are located in remote, isolated areas that will present a logistical challenge to any rehabilitation effort.

MPH was retained to select dieback sites suitable for demonstrating marsh rehabilitation techniques recommended in this critical shoreline assessment report. Based on the site selection criteria set forth in Section VI and our experience, the Leeville-Fourchon Area is considered to be the best area for demonstrating the recommended remedial construction methods. MPH recommends increasing the marsh elevation using a small dredge at three 10-acre sites, constructing a rock shoreline protection system in front of one of the demonstration sites, revegetating each 10-acre site with *Spartina alterniflora,* and performing aerial seeding within the worst dieback areas. Continued monitoring of the dieback areas is also recommended.

A. Hydraulic Fill Demonstration Sites

MPH recommends increasing the marsh elevation at three 10-acre sites using hydraulic dredge construction techniques. Two of the demonstration sites are located along the west bank of Bayou Lafourche. Site 1 is located north of Port Fourchon, approximately one mile north of Havoline Canal and Site 2 is located immediately west of the mouth of the Havoline Canal along a marsh island. A rock shoreline projection system is also recommended at Site 2, which is subjected to high wave energies. This region complies with the majority of the remediation site selection criteria. It protects inland marsh and islands, has few oyster leases, protects property and infrastructure, is severely impacted, has a research site in the immediate vicinity, and has only one landowner (Burlington, Resources, Inc.) who is responsive to remediation action on their property.

The third demonstration site (Site 3) is located in the Elmer's Island-Chenier Caminada Area along Louisiana State Highway # 1, between Fouchon and Grand Isle. Severe dieback was observed at this site in early 1998. It first appeared to resemble a nutria eat-out, and then progressed to a field of dead stubble, and finally, exposed soils. The site is highly visible from Louisiana State Highway # 1, has two landowners, and protects property and infrastructure. Site 3 also has several isolated oyster leases in the area that could pose a problem for construction. Due to this potential problem, an alternate site was selected between Sites 1 and 2 at the intersection of the west bank of Bayou LaFourche with Havoline Canal. Burlington Resources, Inc. is the landowner of the alternate site location. Sheet 14 illustrates the locations of the proposed demonstration sites.

A small cutter head suction dredge with an 8 to 12-inch diameter discharge pipe would be best suited for placement of the fill material. Dredged fill material should be contained using perimeter earthen dikes and brought to a final fill elevation of approximately 12-inches above existing marsh. After construction completion, the fill areas should be manually revegetated with *Spartina alterniflora* plugs on 5-foot centers along the perimeter and on 8-foot centers within the interior marsh. Marsh creation and revegetation costs are estimated at $250,000 and $200,000, respectively. Assuming a nominal cross sectional area of 75 square feet and a floatation channel is not required, the cost associated with constructing a 1000-foot long shoreline protection system along Site 2 is approximately $225,000. Permitting, surveying, engineering and design, construction inspection and administrative costs will be approximately $150,000 for a nominally designed project. Additional costs will be encountered for extensive surveying, inspecting, testing and monitoring services.

B. Aerial Seeding Demonstration Sites

It is recommended that the most severely impacted dieback areas be aerially seeded using a combination of native vegetation species such as *Spartina alterniflora, Distichlis spicata, Batis maritima,* and *Avicennia germinans* (commonly-oyster grass, saltgrass, saltwort, black mangrove, respectfully). It may be prudent to use indigenous species that are fast growing, invasive, and have an available viable seed source that may be collected locally in the wild. The main concern is to revegetate dieback areas that are totally dead and showing no signs of recovery with the most <u>practical and expedient</u> means possible.

Presently, the dieback areas are showing initial signs of lost surface elevation. Roots of the dead *Spartina alterniflora* stems are becoming exposed and nutria runs providing a conduit for sediment export. Under the present meteorological conditions, some recovery of the dieback areas is underway. However, some of the more severely impacted dieback areas will not recover as easily and will continue to be exposed to erosion forces with subsequent loss of surface elevation.

Aerial seeding represents the most cost efficient method for widespread regional application. Once vegetation is established, *Spartina alterniflora* may be reintroduced as needed by plantings. Cost associated with aerial seeding generally average between $100-$200 per acre. Aerial seeding of the dieback areas may be performed utilizing regional airports located in Houma, Louisiana and the South Lafourche Airport in Galliano, Louisiana. The Pointe aux Chene Ridge Area (Felicity Island) and the Leeville-Fourchon Area present dieback areas that are well suited for demonstration of aerial seed application. Both sites have extensive dieback areas and are in relatively close proximity to airports.

C. Recurrent Observation of the Dieback Areas

It is further recommended that actual visual observation flights continue to be used to monitor and document the condition of the dieback areas. The LDWF vegetation transects offer the most suitable and established standard operating procedure. A minimum of two flights per year is recommended, one during the middle of the growing season and the other as the natural browning of the marsh begins to occur. With continued observations after one full growing season, the extent of the severely impacted dieback areas will be identified, documented, and recorded for future established remediation efforts.

Table 1
Summary of Severely Impacted Dieback Areas

Area I.D.	Location Description	Drawing No.	Area (Acres)
A	Pointe au Fer Island	Sheet 3	218
B	Oyster Bayou	Sheet 3	98
C	Bay Junop	Sheet 3	505
D	Taylor Bayou - Grand B. DuLarge	Sheet 4	1,117
E	Bayou Grand Caillou	Sheet 4	1,086
F	Dog Lake	Sheet 4	1,573
G	Pelican Lake - Lake Pelto	Sheet 5	287
H	Bayou Sale	Sheet 5	246
I	Cocodrie	Sheet 6	487
J	Lake Barre	Sheet 6	914
K	Lake Tambour - Lake Chien	Sheet 7	579
L	Pointe au Chene Ridge	Sheet 7	1,980
M	Little Lake	Sheet 8	699
N	Leeville-Fourchon	Sheet 8	4,215
O	Elmer's Is- Chenier Camanada	Sheet 9	64
P	Bayou Ferblanc	Sheet 9	55
Q	Creole Bay	Sheet 9	163
R	Queen Bess Island	Sheet 10	86
S	E. Grand Terre- Grand Pierre	Sheet 10	91
T	Grand Pierre	Sheet 11	674
U	Joe Wise Bay	Sheet 11	20
	Total Severely Impacted Dieback Area		**15,158**

Table 2 (Cont.)
Severely Impacted Dieback Acreages By Area

A			B			C			D			E			F			G		
Sheet 3 Pointe au Fer Island			Sheet 3 Oyster Bayou			Sheet 3 Bay Junop			Sheet 4 Taylor Bayou - Grand B. DuLarge			Sheet 4 Bayou Grand Caillou			Sheet 4 Dog Lake			Sheet 5 Pelican Lake - Lake Pelto		
I.D. No.	Area (Sq. Ft.)	Area (Acres)	I.D. No.	Area (Sq. Ft.)	Area (Acres)	I.D. No.	Area (Sq. Ft.)	Area (Acres)	I.D. No.	Area (Sq. Ft.)	Area (Acres)	I.D. No.	Area (Sq. Ft.)	Area (Acres)	I.D. No.	Area (Sq. Ft.)	Area (Acres)	I.D. No.	Area (Sq. Ft.)	Area (Acres)
A-1	1,444,730	33.2	B-1	721,663	16.6	C-1	10,886	0.2	D-1	680,600	15.6	E-1	851,966	19.6	F-1	1,113,665	25.6	G-1	492,626	11.3
A-2	4,058,891	93.2	B-2	1,216,172	27.9	C-2	237,453	5.5	D-2	709,632	16.3	E-2	625,037	14.3	F-2	180,706	4.1	G-2	369,198	8.5
A-3	322,504	7.4	B-3	1,174,573	27.0	C-3	216,589	5.0	D-3	4,627,714	106.2	E-3	172,788	4.0	F-3	249,356	5.7	G-3	331,689	7.6
A-4	3,656,461	83.9	B-4	1,154,475	26.5	C-4	188,738	4.3	D-4	556,019	12.8	E-4	165,836	3.8	F-4	227,494	5.2	G-4	1,524,329	35.0
						C-5	3,445,003	79.1	D-5	1,144,010	26.3	E-5	144,516	3.3	F-5	335,217	7.7	G-5	52,555	1.2
						C-6	44,908	1.0	D-6	708,897	16.3	E-6	356,176	8.2	F-6	796,524	18.3	G-6	714,625	16.4
						C-7	995,852	22.9	D-7	23,121	0.5	E-7	1,142,683	26.2	F-7	850,772	19.5	G-7	422,625	9.7
						C-8	246,650	5.7	D-8	101,173	2.3	E-8	447,759	10.3	F-8	493,282	11.3	G-8	20,717	0.5
						C-9	72,313	1.7	D-9	88,219	2.0	E-9	3,741,193	85.9	F-9	8,176,102	187.7	G-9	372,686	8.6
						C-10	340,413	7.8	D-10	676,890	15.5	E-10	484,495	11.1	F-10	21,629,215	496.5	G-10	64,986	1.5
						C-11	64,606	1.5	D-11	520,622	12.0	E-11	484,784	11.1	F-11	1,311,880	30.1	G-11	1,168,434	26.8
						C-12	269,083	6.2	D-12	12,825,862	294.4	E-12	1,567,367	36.0	F-12	173,734	4.0	G-12	334,306	7.7
						C-13	179,389	4.1	D-13	4,672,964	107.3	E-13	2,445,672	56.1	F-13	435,627	10.0	G-13	206,733	4.7
						C-14	167,911	3.9	D-14	3,937,154	90.4	E-14	419,000	9.6	F-14	190,325	4.4	G-14	169,006	3.9
						C-15	2,345,995	53.9	D-15	826,562	19.0	E-15	311,836	7.2	F-15	1,851,923	42.5	G-15	267,575	6.1
						C-16	2,303,032	52.9	D-16	2,843,659	65.3	E-16	4,024,471	92.4	F-16	27,267,063	626.0	G-16	270,628	6.2
						C-17	1,763,235	40.5	D-17	237,764	5.5	E-17	277,933	6.4	F-17	163,547	3.8	G-17	424,371	9.7
						C-18	184,144	4.2	D-18	4,281,159	98.3	E-18	2,031,289	46.6	F-18	622,521	14.3	G-18	305,721	7.0
						C-19	690,008	15.8	D-19	635,138	14.6	E-19	59,680	1.4	F-19	1,612,797	37.0	G-19	40,780	0.9
						C-20	2,011,977	46.2	D-20	762,283	17.5	E-20	112,208	2.6	F-20	241,638	5.5	G-20	483,032	11.1
						C-21	808,726	18.6	D-21	2,175,945	50.0	E-21	254,287	5.8	F-21	329,550	7.6	G-21	442,252	10.2
						C-22	241,289	5.5	D-22	337,754	7.8	E-22	76,665	1.8	F-22	284,627	6.5	G-22	255,364	5.9
						C-23	562,271	12.9	D-23	763,228	17.5	E-23	64,160	1.5				G-23	2,409,487	55.3
						C-24	2,932,101	67.3	D-24	1,296,134	29.8	E-24	474,776	10.9				G-24	142,402	3.3
						C-25	741,313	17.0	D-25	215,207	4.9	E-25	751,933	17.3				G-25	313,277	7.2
						C-26	306,306	7.0	D-26	51,834	1.2	E-26	158,262	3.6				G-26	330,599	7.6
						C-27	635,076	14.6	D-27	164,059	3.8	E-27	375,446	8.6				G-27	586,365	13.5
									D-28	1,243,108	28.5	E-28	838,576	19.3						
									D-29	1,002,779	23.0	E-29	185,651	4.3						
									D-30	180,965	4.2	E-30	24,019	0.6						
									D-31	378,900	8.7	E-31	1,436,592	33.0						
												E-32	394,754	9.1						
												E-33	148,389	3.4						
												E-34	85,873	2.0						
												E-35	160,903	3.7						
												E-36	553,768	12.7						
												E-37	225,244	5.2						
												E-38	1,249,443	28.7						
												E-39	5,886,467	135.1						
												E-40	2,081,250	47.8						
												E-41	10,707,151	245.8						
												E-42	533,894	12.3						
												E-43	169,505	3.9						
												E-44	165,708	3.8						
												E-45	216,566	5.0						
												E-46	202,168	4.6						
	9,482,586	**218**		4,266,883	**98**		22,005,267	**505**		48,669,355	**1,117**		47,288,139	**1,086**		68,537,565	**1,573**		12,516,368	**287**

Table 2 (Cont.)
Severely Impacted Dieback Acreages By Area

H		
Sheet 5 Bayou Sale		
I.D. No.	Area (Sq. Ft.)	Area (Acres)
H-1	182,639	4.2
H-2	39,819	0.9
H-3	234,648	5.4
H-4	813,303	18.7
H-5	254,429	5.8
H-6	372,873	8.6
H-7	374,957	8.6
H-8	568,253	13.0
H-9	734,621	16.9
H-10	486,975	11.2
H-11	137,370	3.2
H-12	267,627	6.1
H-13	142,821	3.3
H-14	641,021	14.7
H-15	645,710	14.8
H-16	827,667	19.0
H-17	615,570	14.1
H-18	886,583	20.4
H-19	1,854,836	42.6
H-20	218,178	5.0
H-21	298,440	6.9
H-22	55,462	1.3
H-23	64,198	1.5
	10,718,000	**246**

I		
Sheet 6 Cocodrie		
I.D. No.	Area (Sq. Ft.)	Area (Acres)
I-1	1,903,442	43.7
I-2	12,847,288	294.9
I-3	219,260	5.0
I-4	402,955	9.3
I-5	625,915	14.4
I-6	443,216	10.2
I-7	91,228	2.1
I-8	72,108	1.7
I-9	81,081	1.9
I-10	152,209	3.5
I-11	101,472	2.3
I-12	954,603	21.9
I-13	463,789	10.6
I-14	344,583	7.9
I-15	89,722	2.1
I-16	124,984	2.9
I-17	279,934	6.4
I-18	358,459	8.2
I-19	895,912	20.6
I-20	127,531	2.9
I-21	134,510	3.1
I-22	108,968	2.5
I-23	93,148	2.1
I-24	80,869	1.9
I-25	49,561	1.1
I-26	160,963	3.7
	21,207,710	**487**

J		
Sheet 6 Lake Barre		
I.D. No.	Area (Sq. Ft.)	Area (Acres)
J-1	148,049	3.4
J-2	156,006	3.6
J-3	697,526	16.0
J-4	823,378	18.9
J-5	520,370	11.9
J-6	950,486	21.8
J-7	2,002,881	46.0
J-8	1,479,541	34.0
J-9	1,090,369	25.0
J-10	4,600,861	105.6
J-11	461,821	10.6
J-12	472,385	10.8
J-13	218,199	5.0
J-14	337,769	7.8
J-15	11,034,626	253.3
J-16	348,867	8.0
J-17	202,961	4.7
J-18	319,321	7.3
J-19	346,995	8.0
J-20	2,541,480	58.3
J-21	252,603	5.8
J-22	402,714	9.2
J-23	792,665	18.2
J-24	61,632	1.4
J-25	127,504	2.9
J-26	46,341	1.1
J-27	758,482	17.4
J-28	56,164	1.3
J-29	186,288	4.3
J-30	128,960	3.0
J-31	332,017	7.6
J-32	282,623	6.5
J-33	129,845	3.0
J-34	55,831	1.3
J-35	44,590	1.0
J-36	88,423	2.0
J-37	56,587	1.3
J-38	64,240	1.5
J-39	125,172	2.9
J-40	92,486	2.1
J-41	426,080	9.8
J-42	795,419	18.3
J-43	81,858	1.9
J-44	902,684	20.7
J-45	407,801	9.4
J-46	265,196	6.1
J-47	545,538	12.5
J-48	1,909,578	43.8
J-49	1,646,144	37.8
	39,819,356	**914**

K		
Sheet 7 Lake Tambour - Lake Chien		
I.D. No.	Area (Sq. Ft.)	Area (Acres)
K-1	539,577	12.4
K-2	331,079	7.6
K-3	3,833,571	88.0
K-4	1,112,892	25.5
K-5	400,128	9.2
K-6	276,648	6.4
K-7	497,742	11.4
K-8	176,110	4.0
K-9	732,432	16.8
K-10	1,313,433	30.2
K-11	666,430	15.3
K-12	224,468	5.2
K-13	329,054	7.6
K-14	7,297,224	167.5
K-15	18,738	0.4
K-16	32,323	0.7
K-17	474,351	10.9
K-18	2,193,845	50.4
K-19	565,443	13.0
K-20	356,494	8.2
K-21	264,953	6.1
K-22	502,368	11.5
K-23	567,067	13.0
K-24	2,511,540	57.7
	25,217,910	**579**

L		
Sheet 7 Pointe au Chene Ridge		
I.D. No.	Area (Sq. Ft.)	Area (Acres)
L-1	12,526,135	287.6
L-2	29,880,623	686.0
L-3	17,795,519	408.5
L-4	11,242,048	258.1
L-5	8,596,510	197.3
L-6	4,855,869	111.5
L-7	143,687	3.3
L-8	445,990	10.2
L-9	203,401	4.7
L-10	287,000	6.6
L-11	273,938	6.3
	86,250,720	**1,980**

M		
Sheet 8 Little Lake		
I.D. No.	Area (Sq. Ft.)	Area (Acres)
M-1	1,031,031	23.7
M-2	2,710,240	62.2
M-3	1,973,891	45.3
M-4	110,781	2.5
M-5	226,391	5.2
M-6	4,622,295	106.1
M-7	517,267	11.9
M-8	666,522	15.3
M-9	761,798	17.5
M-10	1,410,821	32.4
M-11	560,603	12.9
M-12	159,665	3.7
M-13	222,682	5.1
M-14	1,460,249	33.5
M-15	6,215,451	142.7
M-16	204,943	4.7
M-17	7,076,199	162.4
M-18	529,457	12.2
	30,460,286	**699**

N		
Sheet 8 Leeville-Fourchon		
I.D. No.	Area (Sq. Ft.)	Area (Acres)
N-1	51,884	1.2
N-2	71,520	1.6
N-3	191,201	4.4
N-4	395,611	9.1
N-5	62,813	1.4
N-6	63,413	1.5
N-7	56,567	1.3
N-8	109,981	2.5
N-9	615,590	14.1
N-10	2,526,794	58.0
N-11	796,716	18.3
N-12	4,350,162	99.9
N-13	988,422	22.7
N-14	1,036,651	23.8
N-15	65,222	1.5
N-16	1,528,435	35.1
N-17	423,295	9.7
N-18	505,206	11.6
N-19	8,745,068	200.8
N-20	47,137,903	1,082.1
N-21	27,849,491	639.3
N-22	8,503,120	195.2
N-23	1,981,090	45.5
N-24	22,129,443	508.0
N-25	390,390	9.0
N-26	561,069	12.9
N-27	64,038	1.5
N-28	405,663	9.3
N-29	492,744	11.3
N-30	3,070,877	70.5
N-31	1,144,110	26.3
N-32	1,502,426	34.5
N-33	3,827,785	87.9
N-34	11,488,529	263.7
N-35	8,581,668	197.0
N-36	8,931,622	205.0
N-37	473,707	10.9
N-38	1,767,507	40.6
N-39	6,496,574	149.1
N-40	529,573	12.2
N-41	2,664,998	61.2
N-42	627,007	14.4
N-43	66,472	1.5
N-44	331,256	7.6
	183,603,613	**4,215**

Table 2 (Cont.)
Severely Impacted Dieback Acreages By Area

O			P			Q			R			S			T			U		
Sheet 9 Elmer's Is- Chenier Camanada			Sheet 9 Bayou Ferblanc			Sheet 9 Creole Bay			Sheet 10 Queen Bess Island			Sheet 10 E. Grand Terre- Grand Pierre			Sheet 11 Grand Pierre			Sheet 11 Joe Wise Bay		
I.D. No.	Area (Sq. Ft.)	Area (Acres)		Area (Sq. Ft.)	Area (Acres)	I.D. No.	Area (Sq. Ft.)	Area (Acres)	I.D. No.	Area (Sq. Ft.)	Area (Acres)		Area (Sq. Ft.)	Area (Acres)	I.D. No.	Area (Sq. Ft.)	Area (Acres)	I.D. No.	Area (Sq. Ft.)	Area (Acres)
O-1	462,438	10.6	P-1	72,501	1.7	Q-1	472,928	10.9	R-1	22,104	0.5	S-1	66,926	1.5	T-1	7,241,577	166.2	U-1	56,308	1.3
O-2	386,417	8.9	P-2	99,079	2.3	Q-2	110,361	2.5	R-2	25,798	0.6	S-2	237,546	5.5	T-2	1,069,144	24.5	U-2	26,924	0.6
O-3	135,789	3.1	P-3	208,569	4.8	Q-3	97,919	2.2	R-3	45,008	1.0	S-3	43,578	1.0	T-3	792,523	18.2	U-3	37,226	0.9
O-4	185,774	4.3	P-4	69,919	1.6	Q-4	92,347	2.1	R-4	141,573	3.3	S-4	86,536	2.0	T-4	55,371	1.3	U-4	215,398	4.9
O-5	79,732	1.8	P-5	100,131	2.3	Q-5	245,118	5.6	R-5	57,730	1.3	S-5	58,990	1.4	T-5	79,955	1.8	U-5	134,155	3.1
O-6	273,588	6.3	P-6	140,625	3.2	Q-6	304,290	7.0	R-6	29,573	0.7	S-6	88,750	2.0	T-6	1,129,082	25.9	U-6	119,406	2.7
O-7	1,269,872	29.2	P-7	443,018	10.2	Q-7	252,271	5.8	R-7	166,519	3.8	S-7	123,382	2.8	T-7	3,341,240	76.7	U-7	272,174	6.2
			P-8	34,723	0.8	Q-8	173,581	4.0	R-8	112,000	2.6	S-8	55,801	1.3	T-8	4,176,351	95.9			
			P-9	161,143	3.7	Q-9	601,716	13.8	R-9	157,933	3.6	S-9	26,749	0.6	T-9	360,791	8.3			
			P-10	198,915	4.6	Q-10	121,389	2.8	R-10	587,844	13.5	S-10	24,899	0.6	T-10	7,363,674	169.0			
			P-11	737,498	16.9	Q-11	53,862	1.2	R-11	635,035	14.6	S-11	28,166	0.6	T-11	1,800,209	41.3			
			P-12	120,125	2.8	Q-12	1,080,765	24.8	R-12	513,108	11.8	S-12	25,863	0.6	T-12	187,836	4.3			
						Q-13	660,987	15.2	R-13	1,016,496	23.3	S-13	86,448	2.0	T-13	163,421	3.8			
						Q-14	240,028	5.5	R-14	217,229	5.0	S-14	299,843	6.9	T-14	95,198	2.2			
						Q-15	164,308	3.8				S-15	197,164	4.5	T-15	314,028	7.2			
						Q-16	432,331	9.9				S-16	192,056	4.4	T-16	81,242	1.9			
						Q-17	182,349	4.2				S-17	209,055	4.8	T-17	98,919	2.3			
						Q-18	948,937	21.8				S-18	213,633	4.9	T-18	488,157	11.2			
						Q-19	365,731	8.4				S-19	40,899	0.9	T-19	102,080	2.3			
						Q-20	510,198	11.7				S-20	470,374	10.8	T-20	54,084	1.2			
												S-21	306,224	7.0	T-21	67,982	1.6			
												S-22	39,578	0.9	T-22	77,708	1.8			
												S-23	76,873	1.8	T-23	64,642	1.5			
												S-24	127,220	2.9	T-24	70,473	1.6			
												S-25	94,382	2.2	T-25	81,242	1.9			
												S-26	656,113	15.1	T-26	9,833	0.2			
												S-27	92,868	2.1						
	2,793,610	**64**		2,386,246	**55**		7,111,416	**163**		3,727,950	**86**		3,969,916	**91**		29,366,762	**674**		525,735	**20**

Table 3 (Cont.)
Summary of Approximate Bay and Gulf
Shoreline Lengths by Group

A Sheet 3 Pointe au Fer Island		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
A-1	Interior Marsh Only	
A-2	Interior Marsh Only	
A-3	Interior Marsh Only	
A-4	Interior Marsh Only	
Feet	-	-
Miles	**-**	**-**

B Sheet 3 Oyster Bayou		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
B-1	Interior Marsh Only	
B-2	Interior Marsh Only	
B-3	Interior Marsh Only	
B-4	Interior Marsh Only	
Feet	-	-
Miles	**-**	**-**

C Sheet 3 Bay Junop		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
C-1	566	
C-2	658	
C-3	Interior Marsh Only	
C-4	Interior Marsh Only	
C-5	8,978	
C-6	392	
C-7	Interior Marsh Only	
C-8	1,401	
C-9	1,173	
C-10	Interior Marsh Only	
C-11	508	
C-12	Interior Marsh Only	
C-13	1,733	
C-14	291	
C-15	3,009	
C-16	1,479	
C-17	1,472	
C-18	Interior Marsh Only	
C-19	Interior Marsh Only	
C-20	Interior Marsh Only	
C-21	Interior Marsh Only	
C-22	Interior Marsh Only	
C-23	Interior Marsh Only	
C-24	2,592	1,727
C-25		1,074
C-26		1,095
C-27		904
Feet	24,252	4,800
Miles	**4.6**	**0.9**

D Sheet 4 Taylor Bayou - Grand B. DuLarge		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
D-1	1,133	
D-2	325	
D-3	4,152	
D-4	Interior Marsh Only	
D-5	Interior Marsh Only	
D-6	Interior Marsh Only	
D-7	Interior Marsh Only	
D-8	Interior Marsh Only	
D-9	Interior Marsh Only	
D-10	Interior Marsh Only	
D-11		4,543
D-12	30,000	
D-13	Interior Marsh Only	
D-14		
D-15	454	
D-16		5,223
D-17	Interior Marsh Only	
D-18		5,634
D-19	Interior Marsh Only	
D-20	Interior Marsh Only	
D-21		1,246
D-22	Interior Marsh Only	
D-23	Interior Marsh Only	
D-24	Interior Marsh Only	
D-25	Interior Marsh Only	
D-26	Interior Marsh Only	
D-27	Interior Marsh Only	
D-28	Interior Marsh Only	
D-29	Interior Marsh Only	
D-30		1,143
D-31		1,687
Feet	36,064	19,476
Miles	**6.8**	**3.7**

E Sheet 4 Bayou Grand Caillou		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
E-1	Interior	
E-2	1,233	
E-3	579	
E-4	1,098	
E-5	Interior Marsh Only	
E-6	Interior Marsh Only	
E-7	1,714	
E-8	1,500	
E-9	936	
E-10	1,100	
E-11	1,157	
E-12	Interior Marsh Only	
E-13	4,000	
E-14	965	
E-15	Interior Marsh Only	
E-16	Interior Marsh Only	
E-17	Interior Marsh Only	
E-18	3,539	
E-19		
E-20	783	
E-21	Interior Marsh Only	
E-22	606	
E-23	648	
E-24	Interior Marsh Only	
E-25	Interior Marsh Only	
E-26	1,104	
E-27	Interior Marsh Only	
E-28	Interior Marsh Only	
E-29	468	
E-30	Interior Marsh Only	
E-31		1,482
E-32		981
E-33	723	
E-34	Interior Marsh Only	
E-35	Interior Marsh Only	
E-36		737
E-37		925
E-38	Interior Marsh Only	
E-39	Interior Marsh Only	
E-40	Interior Marsh Only	
E-41		3,405
E-42	Interior Marsh Only	
E-43	380	
E-44	Interior Marsh Only	
E-45		1,037
E-46		1,089
Feet	22,531	9,656
Miles	**4.3**	**1.8**

F Sheet 4 Dog Lake		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
F-1	2,194	
F-2	1,299	
F-3	1,285	
F-4	Interior Marsh Only	
F-5	Interior Marsh Only	
F-6	Interior Marsh Only	
F-7	Interior Marsh Only	
F-8	Interior Marsh Only	
F-9	1,881	
F-10	1,642	
F-11	Interior Marsh Only	
F-12	908	
F-13	Interior Marsh Only	
F-14	Interior Marsh Only	
F-15	Interior Marsh Only	
F-16	Interior Marsh Only	
F-17	Interior Marsh Only	
F-18	Interior Marsh Only	
F-19		1,394
F-20		593
F-21		581
F-22		650
Feet	9,208	3,217
Miles	**1.7**	**0.6**

G Sheet 5 Pelican Lake - Lake Pelto		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
G-1	Interior Marsh Only	
G-2	Interior Marsh Only	
G-3	Interior Marsh Only	
G-4	Interior Marsh Only	
G-5	Interior Marsh Only	
G-6	Interior Marsh Only	
G-7	Interior Marsh Only	
G-8	Interior Marsh Only	
G-9	Interior Marsh Only	
G-10	Interior Marsh Only	
G-11	791	
G-12	Interior Marsh Only	
G-13	880	
G-14	Interior Marsh Only	
G-15	671	
G-16	1,738	
G-17	1,886	
G-18	1,802	
G-19	Interior Marsh Only	
G-20	Interior Marsh Only	
G-21	Interior Marsh Only	
G-22	645	
G-23		2,788
G-24		1,577
G-25	Interior Marsh Only	
G-26		1,702
G-27		1,037
Feet	8,413	7,104
Miles	**1.6**	**1.3**

302718.3

Table 3 (Cont.)
Summary of Approximate Bay and Gulf
Shoreline Lengths by Group

H			I			J			K			L			M			N		
Sheet 5 Bayou Sale			Sheet 6 Cocodrie			Sheet 6 Lake Barre			Sheet 7 Lake Tambour - Lake Chien			Sheet 7 Pointe au Chene Ridge			Sheet 8 Little Lake			Sheet 8 Leeville-Fourchon		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)	I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)	I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)	I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)	I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)	I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)	I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
H-1	Interior Marsh Only		I-1	1,108		J-1	1,813		K-1	Interior Marsh Only		L-1		6,199	M-1	Interior Marsh Only		N-1	Interior Marsh Only	
H-2	Interior Marsh Only		I-2	8,635	4,587	J-2	1,606		K-2	Interior Marsh Only		L-2		12,846	M-2		3,519	N-2	Interior Marsh Only	
H-3	Interior Marsh Only		I-3	Interior Marsh Only		J-3	1,595		K-3	2,522		L-3		10,369	M-3		2,067	N-3	Interior Marsh Only	
H-4	Interior Marsh Only		I-4	814		J-4	Interior Marsh		K-4	Interior Marsh Only		L-4		12,022	M-4		1,310	N-4	Interior Marsh Only	
H-5	Interior Marsh Only		I-5		1,044	J-5	Interior Marsh		K-5	1,060		L-5		21,433	M-5		2,229	N-5	Interior Marsh Only	
H-6	Interior Marsh Only		I-6		760	J-6	Interior Marsh		K-6	Interior Marsh Only		L-6		23,783	M-6	3,822	3,479	N-6	Interior Marsh Only	
H-7	Interior Marsh Only		I-7	779		J-7	Interior Marsh		K-7	Interior Marsh Only		L-7		2,023	M-7	Interior Marsh Only		N-7	529	
H-8	Interior Marsh Only		I-8	1,071		J-8	1,207		K-8	717		L-8		4,830	M-8	Interior Marsh Only		N-8	393	
H-9	Interior Marsh Only		I-9	1,094		J-9	Interior Marsh		K-9	2,269		L-9		1,915	M-9	Interior Marsh Only		N-9	632	
H-10	Interior Marsh Only		I-10		930	J-10	Interior Marsh		K-10	4,579		L-10		3,222	M-10	Interior Marsh Only		N-10	2,471	
H-11	Interior Marsh Only		I-11		845	J-11	1,056		K-11	906		L-11		2,657	M-11	Interior Marsh Only		N-11	Interior Marsh Only	
H-12	Interior Marsh Only		I-12		1,038	J-12	1,249		K-12	847					M-12	Interior Marsh Only		N-12	1,024	
H-13	Interior Marsh Only		I-13		926	J-13	Interior Marsh Only		K-13	Interior Marsh Only					M-13	Interior Marsh Only		N-13	500	
H-14	Interior Marsh Only		I-14		755	J-14	Interior Marsh Only		K-14	4,515					M-14	Interior Marsh Only		N-14	Interior Marsh Only	
H-15	Interior Marsh Only		I-15	Interior Marsh Only		J-15		1,913	K-15	Interior Marsh Only					M-15	4,523		N-15	Interior Marsh Only	
H-16	Interior Marsh Only		I-16	Interior Marsh Only		J-16	Interior Marsh Only		K-16	Interior Marsh Only					M-16	Interior Marsh Only		N-16	Interior Marsh Only	
H-17	Interior Marsh Only		I-17	Interior Marsh Only		J-17	Interior Marsh Only		K-17	Interior Marsh Only					M-17		4,885	N-17	Interior Marsh Only	
H-18	Interior Marsh Only		I-18	Interior Marsh Only		J-18	Interior Marsh Only		K-18	Interior Marsh Only					M-18	Interior Marsh Only		N-18	Interior Marsh Only	
H-19	Interior Marsh Only		I-19		2,430	J-19	Interior Marsh Only		K-19		1,361							N-19	4,357	6,893
H-20	Interior Marsh Only		I-20		1,985	J-20		1,222	K-20		1,078							N-20	Interior Marsh Only	
H-21	Interior Marsh Only		I-21		1,525	J-21		1,073	K-21		1,084							N-21	18,203	8,704
H-22	Interior Marsh Only		I-22		638	J-22		1,636	K-22	Interior Marsh Only								N-22	2,343	17,292
H-23	Interior Marsh Only		I-23		834	J-23	Interior Marsh Only		K-23	Interior Marsh Only								N-23	Interior Marsh Only	
			I-24	Interior Marsh Only		J-24	Interior Marsh Only		K-24		7,559							N-24	7,076	6,722
			I-25	Interior Marsh Only		J-25	Interior Marsh Only											N-25		3,209
			I-26		874	J-26	Interior Marsh Only											N-26		4,880
						J-27	Interior Marsh Only											N-27		1,216
						J-28	Interior Marsh Only											N-28		1,811
						J-29	1,061											N-29		832
						J-30	Interior Marsh Only											N-30		12,085
						J-31	Interior Marsh Only											N-31		2,976
						J-32	Interior Marsh Only											N-32		837
						J-33	Interior Marsh Only											N-33	Interior Marsh Only	
						J-34	Interior Marsh Only											N-34		1,413
						J-35	Interior Marsh Only											N-35	Interior Marsh Only	
						J-36	Interior Marsh Only											N-36		17,412
						J-37	Interior Marsh Only											N-37	Interior Marsh Only	
						J-38	Interior Marsh Only											N-38	Interior Marsh Only	
						J-39	Interior Marsh Only											N-39		1,728
						J-40	Interior Marsh Only											N-40		1,850
						J-41	Interior Marsh Only											N-41	Interior Marsh Only	
						J-42	Interior Marsh Only											N-42	Interior Marsh Only	
						J-43	Interior Marsh Only											N-43	Interior Marsh Only	
						J-44	Interior Marsh Only											N-44	Interior Marsh Only	
						J-45	730													
						J-46	958													
						J-47	Interior Marsh Only													
						J-48	Interior Marsh Only													
						J-49	Interior Marsh Only													
Feet	-	-	Feet	13,500	19,171	Feet	11,275	5,844	Feet	17,414	11,082	Feet	-	101,297	Feet	8,345	17,489	Feet	37,529	89,861
Miles	**-**	**-**	Miles	**2.6**	**3.6**	Miles	**2.1**	**1.1**	Miles	**3.3**	**2.1**	Miles	**-**	**19.2**	Miles	**1.6**	**3.3**	Miles	**7.1**	**17.0**

Table 3 (Cont.)
Summary of Approximate Bay and Gulf
Shoreline Lengths by Group

O		
Sheet 9 Elmer's Is- Chenier Camanada		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
O-1		740
O-2		690
O-3	Interior Marsh Only	
O-4	Interior Marsh Only	
O-5		1,028
O-6		2,508
O-7	2,769	
Feet	2,769	4,966
Miles	**0.5**	**0.9**

P		
Sheet 9 Bayou Ferblanc		
	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
P-1	Interior	
P-2	Interior Marsh Only	
P-3	Interior Marsh Only	
P-4	Interior Marsh Only	
P-5	Interior Marsh Only	
P-6	Interior Marsh Only	
P-7	Interior Marsh Only	
P-8	Interior Marsh Only	
P-9	Interior Marsh Only	
P-10	Interior Marsh Only	
P-11	Interior Marsh Only	
P-12	Interior Marsh Only	
Feet	-	-
Miles	**-**	**-**

Q		
Sheet 9 Creole Bay		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
Q-1	862	
Q-2	Interior Marsh Only	
Q-3	Interior Marsh Only	
Q-4	Interior Marsh Only	
Q-5	Interior Marsh Only	
Q-6	Interior Marsh Only	
Q-7	Interior Marsh Only	
Q-8	Interior Marsh Only	
Q-9	1,157	
Q-10	Interior Marsh Only	
Q-11	372	
Q-12	Interior Marsh Only	
Q-13	Interior Marsh Only	
Q-14	Interior Marsh Only	
Q-15	Interior Marsh Only	
Q-16	Interior Marsh Only	
Q-17	Interior Marsh Only	
Q-18	Interior Marsh Only	
Q-19	1,545	
Q-20	Interior Marsh Only	
Feet	3,935	-
Miles	**0.7**	**-**

R		
Sheet 10 Queen Bess Island		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
R-1	579	
R-2	645	
R-3	831	
R-4	896	
R-5	Interior Marsh Only	
R-6	646	
R-7	Interior Marsh Only	
R-8	591	
R-9	591	
R-10	1,793	
R-11	1,080	
R-12	764	
R-13	2,055	
R-14	1,050	
Feet	11,522	-
Miles	**2.2**	**-**

S		
Sheet 10 E. Grand Terre- Grand Pierre		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
S-1	1,076	
S-2	2,048	
S-3	1,045	
S-4	1,292	
S-5	1,253	
S-6	1,214	
S-7	1,640	
S-8	1,011	
S-9	884	
S-10	616	
S-11	710	
S-12	617	
S-13	1,195	
S-14	1,341	
S-15	1,293	
S-16	Interior Marsh Only	
S-17	Interior Marsh Only	
S-18	598	
S-19	774	
S-20	Interior Marsh Only	
S-21	794	
S-22	778	
S-23	1,119	
S-24	1,492	
S-25	1,189	
S-26		1,222
S-27		386
Feet	23,981	1,608
Miles	**4.5**	**0.3**

T		
Sheet 11 Grand Pierre		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
T-1	6,073	
T-2	541	
T-3	2,195	
T-4	925	
T-5	1,096	
T-6	2,200	
T-7	5,085	
T-8	2,946	
T-9	2,944	
T-10	9,764	
T-11	2,100	
T-12	729	
T-13	Interior Marsh Only	
T-14	Interior Marsh Only	
T-15	644	570
T-16	Interior Marsh Only	
T-17	Interior Marsh Only	
T-18	910	623
T-19	750	
T-20	Interior Marsh Only	
T-21	343	
T-22		628
T-23		492
T-24		453
T-25		791
T-26	Interior Marsh Only	
Feet	39,243	3,556
Miles	**7.4**	**0.7**

U		
Sheet 11 Joe Wise Bay		
I.D. No.	Bay Leng. (Ft.)	Gulf Leng. (Ft.)
U-1		886
U-2		666
U-3		838
U-4		1,200
U-5	Interior Marsh Only	
U-6	Interior Marsh Only	
U-7	Interior Marsh Only	
Feet	-	3,591
Miles	**-**	**0.7**

Table 4
Ranking Matrix of the Dieback Areas by Group

			Ranking						
Overall Ranking	Group I.D.	Group Description	Total Area	Bay Length	Gulf Length	Ecosystem Impact	Property & Infrastructure	Oyster Leases	Total Score
1	N	Leeville-Fourchon	1	2	2	6	1	2	14
2	D	Taylor Bayou - Grand B. DuLarge	4	3	3	4	11	10	35
3	L	Pointe au Chene Ridge	2	15	1	5	11	3	37
4	E	Bayou Grand Caillou	5	6	7	1	9	9	37
5	K	Lake Tambour - Lake Chien	9	7	6	3	4	11	40
6	J	Lake Barre	6	10	9	2	3	11	41
7	I	Cocodrie	11	8	4	7	2	11	43
8	M	Little Lake	7	12	5	11	6	4	45
9	T	Grand Pierre	8	1	11	10	5	11	46
10	C	Bay Junop	10	4	10	9	11	5	49
11	F	Dog Lake	3	11	12	8	11	11	56
12	G	Pelican Lake - Lake Pelto	12	12	8	14	11	6	63
13	S	E. Grand Terre - Grand Pierre	17	5	13	17	8	7	67
14	R	Queen Bess Island	18	9	14	13	7	11	72
15	Q	Creole Bay	15	13	14	12	11	8	73
16	A	Pointe au Fer Island	14	15	14	21	11	1	76
17	H	Bayou Sale	13	15	14	15	11	11	79
18	O	Elmer's Is- Chenier Camanada	19	14	10	19	10	11	83
19	B	Oyster Bayou	16	15	14	16	11	11	83
20	P	Bayou Ferblanc	20	15	14	18	11	11	89
21	U	Joe Wise Bay	21	15	11	20	11	11	89

Ranking System Definitions:

Total Area - A ranking of 1 was given to the group with the greatest dieback acreage.
Bay Length - A ranking of 1 was given to the group with the longest bay shoreline exposure effecting dieback areas.
Gulf Length - A ranking of 1 was given to the group with the longest Gulf shoreline exposure effecting dieback areas.
Ecosystem Impact - A ranking of 1 was given to the group most susceptible to ecosystem impacts (i.e. loss of land bridges).
Property & Infrastructure - A ranking of 1 was given to the group most susceptible to loss of property and infrastructure.
Oyster Leases - A ranking of 1 was given to the group with the least amount of oyster leases in the area.

Area I.D.	Location Description	Area (Acres)	Bay Length	Gulf	Largest No of Areas
A	Pointe au Fer Island	218	0	0	
B	Oyster Bayou	98	0	0	
C	Bay Junop	505	4.6	0.9	
D	Taylor Bayou - Grand B. DuLarge	1,117	6.8	3.7	
E	Bayou Grand Caillou	1,086	4.3	1.8	
F	Dog Lake	1,573	1.7	0.6	
G	Pelican Lake - Lake Pelto	287	1.6	1.3	
H	Bayou Sale	246	0	0	
I	Cocodrie	487	2.6	3.6	
J	Lake Barre	914	2.1	1.1	
K	Lake Tambour - Lake Chien	579	3.3	2.1	
L	Pointe au Chene Ridge	1,980	0	19.2	
M	Little Lake	699	1.6	3.3	
N	Leeville-Fourchon	4,215	7.1	17	
O	Elmer's Is- Chenier Camanada	64	0.5	0.9	
P	Bayou Ferblanc	55	0	0	
Q	Creole Bay	163	0.7	0	
R	Queen Bess Island	86	2.2	0	
S	E. Grand Terre- Grand Pierre	91	4.5	0.3	
T	Grand Pierre	674	7.4	0.7	
U	Joe Wise Bay	20	0	0.7	

STATE OF LOUISIANA

DEPARTMENT OF NATURAL RESOURCES
COASTAL RESTORATION DIVISION

BROWN MARSH DIEBACK
CRITICAL SHORELINE ASSESSMENT
REPORT

March 20, 2001

La. DNR JOB NO. 4351 BRM
La. DNR CONTRACT NO. 2503-00-28

PREPARED BY:

Matthew B. Sevier, R.E.P. #3081
Registered Environmental Professional

D. Brian Kendrick, P.E. #24672
Senior Project Engineer

mph Morris P. Hebert, Inc.
SURVEYING • ENGINEERING • ENVIRONMENTAL SERVICES

283 Corporate Drive
P.O. Box 3106
Houma, LA 70361
http://www.mphinc.com
(504) 879-2731